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Occult Beliefs

Media distortions, social uncertainty, and deficiencies of human reasoning seem to be at the basis of occult beliefs

Why is an understanding of occult beliefs scientifically and socially important? One reason is their current prevalence in Western societies. Occult beliefs have increased dramatically in the United States during the last two decades (Freedland 1972; Godwin 1972). Far from being a "fad," preoccupation with the occult now forms a pervasive part of our culture. Garden-variety occultisms such as astrology and ESP have swelled to historically unprecedented levels (Eliade 1976). Belief in ESP, for instance, is consistently found to be moderate or strong in 80–90% of our population (Gallup 1978; Polzella et al. 1975); in one survey it ranked as our most popular supernatural belief, edging out belief in God in strength and prevalence (Wuthnow 1978). Ouija boards overtook Monopoly as the nation's best-selling board game in 1967.

As indexed by audience tallies and book sales, more exotic occultisms

such as spoon bending, the Bermuda Triangle, biorhythms, psychic healing, and hauntings have also increased dramatically in variety and popularity since the early 1960s. Von Daniken's book *Chariots of the Gods?*, a vivid account of ancient astronauts' bestowing their technology and spermatozoa upon human beings, has become the best-selling book of modern times. Occult beliefs are salient not only among the lay public, but also among college students, including those at some of our science-oriented campuses. The occult trend shows no signs of diminishing.

The current high level and strength of occult beliefs, which at least implicitly constitute a challenge to the validity of science and to the authority of the scientific community, may be a cause for our concern. This growing trend is also intrinsically of scientific interest as a psychological and sociological phenomenon. The psychological mechanisms involved in occult beliefs may represent more dramatic forms of some mundane pathologies of reasoning. To the extent that occult and mundane beliefs have similar determinants, the study of occult beliefs, which are at the outer limits of irrationality, may throw light on more ordinary reasoning pathologies.

From a sociological point of view, the occult phenomenon is of interest as a possible index of fluctuations in religious belief or social dislocation. Moreover, the study of occult beliefs may further our understanding of scientific belief systems as they are explicitly constructed to compensate for the cognitive shortcomings which characterize many occult beliefs. This article will address the question of the origins and mechanisms of the individual's occult beliefs, a topic which

psychological research is beginning to illuminate. We will also speculate about the social mechanisms that may have given rise to the recent widespread involvement with the occult.

Let us make clear at the outset of this discussion that we do not assume the beliefs and practices termed "occult" or "paranormal" to be totally without validity. They seem rather to span a range from the objectively unsupported at present to the demonstrably absurd. Therefore, to the extent that such beliefs are held widely and strongly, they are probably based on psychological and sociological rather than rational determinants.

A variety of methodological cautions are appropriate in this inquiry. It is likely that differing occult beliefs have different determinants. Evidence suggests, for instance, that those occult beliefs which are institutionalized and are organized around a social community of believers may serve functions similar to those of traditional religions, whereas other beliefs cluster with factors related to escapist entertainment, such as interest in fantasy and science fiction (Bainbridge 1978). Still others may be personally insignificant beliefs acquired desultorily through media misinformation. Determinants may contribute differently at various levels of strength of a particular belief. Further, it has been shown for astrology and spiritualism, for instance, that several disparate demographic populations tend to entertain these beliefs for differing reasons (Jahoda 1969; Robbins et al. 1978).

Research on occult beliefs has not reached the scope and precision necessary to address these complexities

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in full. A complete account of the rise in occult beliefs will have to explain the concomitant rise of such beliefs in other industrialized nations for which data are available (Jahoda 1969), and probably should also account for recent social movements which appear correlated with the occult trend, such as the development of a youth counterculture and the recent spread of pentacostal and charismatic religions through a considerable portion of the world. Social science has provided a number of plausible explanations for these social trends, but little relevant data. However, we believe we can identify at present a number of causal or contributing factors involved in occult beliefs, keeping in mind the strictures discussed above.

Media promotion of the occult

It is not clear how great a role promotion by the popular media played in starting the occult inflation of the early 1960s. The present treatment of the occult by the media, however, may account for much of the near universality of belief. The public is chronically exposed to films, newspaper reports, "documentaries," and books extolling occult or pseudoscientific topics, with critical coverage largely absent. Our most trusted and prestigious sources of information are no exception. When the layperson hears about New Zealand UFOs from Walter Cronkite or reads about new frontiers in psychic healing in a front-page article in the *Los Angeles Times* (1977), he has *prima facie* reasons for believing such phenomena valid. Such uncritical coverage may be due in part to the inherent difficulties of science reporting in a popular medium. However, media coverage of the occult may sometimes be deceptive and monetarily motivated. It is our impression that the public is not aware of the extent to which First Amendment privileges permit such practices. The public seems to trust the printed word implicitly.

Research has consistently shown that people attribute most of their occult beliefs to the popular media and/or to personal experiences (Evans 1973). In a survey of several hundred college students, we were surprised to find that "scientific media" was also listed as a source of occult beliefs—more frequently than popular media, per-

sonal experience, personal faith, or logical arguments. When the students were asked afterwards to list examples of the scientific media in question, however, not one mentioned even a single genuinely scientific source. Instead, *Reader's Digest* and the *National Enquirer* were occasionally cited as "scientific media," as were such films as *The Exorcist* and *Star Wars* (i.e. "the Force"). Television "documentaries" were also frequently mentioned, with the documentary "Chariots of the Gods?" being the single most frequently cited "scientific" source. Scientists have recently brought lawsuits against the television networks in protest of misleading occult documentaries. In response, the networks have claimed that their pro-occult coverage was formally billed as "entertainment" rather than as a "documentary," and that the public can and does make this discrimination. Our evidence does not support these claims.

Although scientists who wish to rebut paranormal claims are sometimes denied access to the media, it also seems to be true that scientists have not extended themselves to gain media access and to issue public rebuttals. Those few scientists who do visibly protest may thus be perceived as stodgy and prejudiced isolates who have not yet climbed on the bandwagon of scientific acceptance of the occult. In addition, scientists have generally not cared to monitor or rebut occult claims issuing from their own academic institutions. Uncritical courses on occult topics are frequently found in the extension division of even our most reputable universities. In our experience the public invariably perceives the university as having then placed its stamp of approval upon the occultism, perhaps as having an entire department devoted to the topic, and understands that the extension instructor is "on the faculty."

The promotion of the occult by the popular media probably serves to heighten the general cognitive "availability" of the occult as an explanatory category in the culture. Puzzling events for which explanations might otherwise be conceived in terms of scientific phenomena or of fraud may tend to be explained as paranormal phenomena when the media bring this category so obtrusively to our attention.

Cognitive biases and heuristics

With occult beliefs currently so prevalent as to constitute, perhaps, part of what it means to be human, we might be justified in speculating on the basic quirks inherent in human psychological structure that support such beliefs. Current research in an area of cognitive psychology termed "cognitive biases and heuristics" has revealed deficits in human inference so universal and so stubborn that they can plausibly account for many of our errant beliefs, including occult ones. This recent spate of research, focusing on human problem-solving and judgmental processes, has resulted in an unflattering portrait of intuitive human reasoning (Nisbett and Ross 1980).

Briefly stated, the findings are that when presented with an array of data or a sequence of events in which they are instructed to discover an underlying order, subjects show strong tendencies to perceive order and causality in random arrays, to perceive a pattern or correlation which seems *a priori* intuitively correct even when the actual correlation in the data is counterintuitive, to jump to conclusions about the correct hypothesis, to seek and to use only positive or confirmatory evidence, to construe evidence liberally as confirmatory, to fail to generate or to assess alternative hypotheses, and, having thus managed to expose themselves only to confirmatory instances, to be fallaciously confident of the validity of their judgments (Jahoda 1969; Einhorn and Hogarth 1978). In the analyzing of past events, these tendencies are exacerbated by selective memory and by failure to appreciate the pitfalls of *post hoc* analyses.

As an illustration of these tendencies, Wason (1960) asked subjects to try to discover a rule he had in mind for generating series of three numbers, where an example of the rule was the series "2, 4, 6." Subjects were to discover the rule by generating their own three-number series and receiving feedback on whether or not each series was an instance of the rule in question. The correct rule was "Any ascending sequence of whole numbers." Subjects typically generated sequences such as "8, 10, 12, 14, 16, 18, etc.," repeatedly, for the duration

of the experiment. They then expressed the rule as, for instance, "Even numbers increasing by two," and, having been consistently confirmed, were highly confident that this rule was the correct one.

When a judgment involves data that are probabilistic or minimally complex, people behave as if they do not possess the concept of probability, basing their estimates on a simple enumeration of positive instances rather than on the ratio of positive to negative instances. In addition, they adopt simplifying judgmental heuristics which can easily result in misconceptions (Tversky and Kahneman 1974). Thus, an instance is judged to be a number of a larger class on the basis of whether or not it seems intuitively to "represent" that class, rather than on the basis of the known number of times the instance in fact falls either in or out of the class; or hypotheses are chosen simply on the basis of their "availability," circumstances which have made them more vivid or salient. For instance, personal experience is more potent in influencing judgments than is abstract data (Nisbett and Ross 1980). When tested in experimental situations, scientists and mathematicians as well as laypersons have displayed the above tendencies (Kahneman and Tversky 1973; Mahoney 1976).

On the whole, then, our everyday intuitions do not seem to serve us well in the understanding of probabilistic or complex patterns in our environment. Under what circumstances will such cognitive biases and limitations lead to occult beliefs? Given that through media or other influences occult ideas are highly available in the culture, and given that there is a tendency to trust intuitive rather than scientific judgments, Marks and Kammann (1979), Myers (1980), and Singer (in press) have shown how occult beliefs can easily be acquired and supported through our cognitive biases and heuristics. For instance, due to our cognitive quirks it is predictable that we will notice and be impressed by the coincidence of a dream and an external event, will overlook the disconfirming instances of failures to match our dreams with reality, and will have difficulty appreciating the concept of random occurrence as an explanation for the coincidences. Even when informed that such matches are predicted to

occur occasionally on the basis of the large number of opportunities for dreams and external events to coincide by chance, we fail to appreciate intuitively the mathematics of rare events. A rare event is seen as one that seldom occurs, regardless of the number of opportunities for its occurrence. As a result of our natural tendency to misunderstand the probabilities involved in a match of dreams and reality, the hypothesis of clairvoyance is apt to be a more intuitively compelling explanation for such an occurrence than the concept of chance.

As another example of cognitive bias, an event that seems mysterious, or difficult to explain through ordinary causes, will seem to us to "represent" a mysterious cause. When an abandoned ship is found floating intact off the coast of Florida, causes such as freakish weather, geysers, or sharks are often dismissed because they seem too rare and therefore inherently unlikely. An explanation in terms of some malevolent occult force in the Bermuda Triangle, however, seems intuitively to represent or "fit" the event better. The representativeness heuristic thus fails entirely to consider the very large number of opportunities for rare but natural causes to determine the event.

In the "illusion of control," another common cognitive fallacy, a random process such as rolling of dice is perceived as under personal control to the extent that it seems to incorporate elements of skill. At Long Beach we have shown (Benassi et al. 1979) that subjects who were permitted practice sessions or active physical involvement in a dice-rolling task reported greater belief in their ability to produce psychokinesis than subjects who were instructed to "influence" the dice but were not permitted such involvement.

Experiments which have attempted to encourage disconfirmation of occult or illusory beliefs by motivating subjects to think through their judgments more carefully or by providing blatant disconfirmatory input have uniformly revealed an astonishing resistance to change of such beliefs. Marks and Kammann (1979), in attempting to reduce the impression of validity of generalized personality descriptions, provided subjects with negatively toned, highly specific, and

inherently unlikely statements about their personality, but found only a slight reduction of belief in their accuracy.

In a series of experiments (Benassi and Singer, in press; Benassi et al., in press) we arranged for an amateur magician to perform three psychic-like stunts—blindfold reading, teleportation of ashes, and mental bending of a metal rod—in front of six introductory psychology classes. Under one condition, the instructors skeptically introduced the performer as an alleged psychic, and under the other as an amateur magician. Belief was assessed through written feedback from the students to the performer. We expected to demonstrate a difference in occult belief depending on the introductory descriptions, but found instead that three-quarters of the subjects in both conditions believed strongly that the performer was psychic; more than a few, in fact, displayed an agitated conviction that the performer was an agent of Satan.

We then added a third condition in which the instructors quite emphatically repeated six different times that the performer was an amateur magician and that the students would be seeing only tricks, and not psychic phenomena. A written check attested that the students had heard and understood their instructors. This manipulation succeeded in reducing the occult belief, but only to the level where 50% of the class believed the performer to be psychic.

In follow-up studies with other subjects we provided neutral written descriptions of the performer and asked for an assessment of whether the performer was genuinely psychic. Again we found a majority of subjects judging that he was. We then asked whether magicians could also perform such stunts as described, and do so in identical fashion, and found near-unanimous agreement that they could; when asked how many people who performed such stunts were likely to be fakes and magicians, instead of genuine psychics, students agreed that the vast majority were likely to be tricksters and magicians. Finally, we asked students to re-estimate the likelihood that the particular performance described was in fact psychic, in light of the information they themselves had just gener-

ated. Once again the performer was judged to be psychic.

Such astonishing stubbornness of illusory and occult beliefs is typical rather than exceptional (Nisbett and Ross 1980). There may be several reasons for this intransigence. First, our intuitive reasoning errors may be like visual illusions. At some abstract level we may suspect that our perceptions are in error, but the error remains just as intuitively compelling. To the extent that we get "lost in the details" of a mental problem, as was probably the case with our subjects who watched or read about our magic act above, the problem becomes increasingly difficult to reason about abstractly. Second, to the extent that our cognitive structuring of our environment is "theory-driven," interpreted through a personal hypothesis, we may be all but blind to any evidence disconfirming our theory.

Finally, in the laboratory reasoning tasks described above, our subjects may not be strongly motivated to reason and behave at their rational best. If we had told them that they must reason accurately or be taken out and shot in the morning, they might have performed better. It may be that occult beliefs, both in the laboratory and in everyday life, surface mainly when they entail little personal cost to the believer. The following section discusses such motivational factors in occult beliefs.

Environment and motivation

Studies in the laboratory and in naturalistic settings have indicated that, in general, superstitions (including occult beliefs) are likely to form under two conditions: environmental uncertainty (roughly conceived as the product of the unpredictability and the magnitude of an event) and low "cost" of the superstition (Jahoda 1969). The erroneous belief may thus alleviate feelings of helplessness and anxiety under uncontrollable or unpredictable circumstances, and in this sense may be functional. Superstitions seldom supplant or intrude upon rational, empirical approaches, where such approaches will serve. In his classic example, the anthropologist Malinowski (1954) described the Trobriand islanders as showing no superstitious behavior when fishing in

their lagoon, where the task was routine and the returns relatively certain, but much superstitious behavior when fishing in the open sea, a more uncertain and dangerous enterprise.

As a modern example, Gmelch (1978) has recently documented the plethora of superstitions surrounding batting (a highly uncertain activity) in baseball, and the absence of superstitions in fielding, where skill and practice can virtually guarantee success. Similarly, Malinowski noted superstitious ritual in the launching of South Sea canoes and the impressive development of the science of navigating them. The islanders had done all they could empirically and rationally in developing their sailing practices, and the added superstitious behavior "cost" little and probably allayed their anxiety. Malinowski has pointed out furthermore that the supernatural and the empirical were typically emphatically compartmentalized from each other: "The body of rational knowledge and the body of magical lore are incorporated each in a different tradition, in a different social setting, and in a different type of activity" (pp. 86–87). This deliberate distinguishing of the non-rational may serve to validate, through contrast, the general validity of rational approaches.

In inspecting modern occultisms, we find that most offer an alleged ability to increase predictability and control, especially under uncertain circumstances. Thus, Tarot cards, clairvoyance, or astrology allow us to "know" the future; biorhythms and psychic healing allow us to regulate our often capricious bodies and health. It is further clear that occultisms in this category "cost" little and do not make many demands on our lives. Despite their often fervidly avowed beliefs in psychic healing, the clients of a psychic surgeon do not go to the "healer" as their first choice, but usually after all else has failed; nor do law enforcement agencies seek the aid of psychics before they have attempted traditional police methods.

Moreover, as with superstitions in South Seas cultures, the occultisms are compartmentalized. On the personal level, people seem easily able to be less than rational in their occult beliefs while being hard-headed where rational approaches are stra-

tegic. We are willing to use astrology in determining our partners for social dating, because nothing else seems to work well, but would not contemplate trusting to the stars if we were making legal and financial arrangements with these same partners. On the societal level, and particularly in America, limited and scaled involvement with the occult may be achieved through commercialization—packaging of the occult as a commodity in graduated quantities. Thus, many occult beliefs seem to be instances of superstitious or magical thought patterns. Cognitive heuristics and biases may serve as a mental substructure which leads to and rationalizes the maintenance of such beliefs, while the circumstances under which they are maintained may be defined by how dearly they cost us.

An explanation in terms of environmental determinants for the rise in occult beliefs since the early 1960s must show that, like other superstitions, occult beliefs increase as a function of environmental uncertainty, and that uncertainty has in fact increased in the last two decades. To begin with, we do have evidence that many occult beliefs are a function of shifting levels of environmental uncertainty. For example, Hyman and Vogt (1979) have shown that the practice of water dowsing was more prevalent in locations where finding water was difficult, and Sales (1973) has found that astrology beliefs increased in the United States during the years of the Depression. Lamar Keene (1976, pp. 70–71), who was once a famous and fraudulent medium, writes: "All mediums would agree. . . . Wars, depressions, personal and national disasters spell prosperity for us. The present economic stresses in the United States are good news for mediums."

There is also evidence that environmental uncertainty in the United States and other Western countries has increased markedly since the early 1960s.

Constructing a working definition of variables such as "environmental uncertainty" at the level of a society is a decidedly complex and ambiguous task. Like the subjects in our experiments, we can find confirming evidence through post hoc analyses, depending on how assiduously we search for it and on the liberality of

our interpretations. It is clear, however, that social change, which may have resulted from or given rise to feelings of uncertainty, has been marked since 1960. The past two decades have seen a decline of membership in the traditional religions in the United States and Europe, though not a decline in private religious belief; increased membership in fundamentalist, charismatic, and pentacostal religions; a proliferation of cults, paganism, and Eastern religions; a 29% rise in belief in the Devil; the development of a youth counter-culture; disruption of traditional patterns in marriage and the family; a feminist movement; an alternative lifestyles movement and change in sexual ethics; the development of a drug culture; and the rise of a "human potential movement" (Glock and Bellah 1976; Wuthnow 1976).

These social trends overlap with the occult belief trend not only in time, but also in structural characteristics and in populations (Gallup 1976; Greeley 1975; Jahoda 1969; Johnson 1979; Wuthnow 1978). The evidence thus suggests that social trends may have caused, or may share causes with, the rise in occult beliefs. A long and unpopular war, political assassinations, and other events of the turbulent 1960s may have contributed to such trends. Other plausible determinants of these social changes include the recent increase in the youth population cohort, a long-term economic decline dating from 1965, and a devaluing of conventional meaning systems through the rising influence of social science. Thus, the *prima facie* case for an increase in environmental uncertainty since the early 1960s, while only partially substantiated in concrete detail, is a strong one.

Beit-Hallahmi (unpubl.) has pointed out that occultisms are not the only form of magical belief that has recently increased. The *National Enquirer*, which has become one of the best-selling newspapers in the United States, features article not only on UFOs and ESP, but also on various miracle discoveries in health, dieting, cure of disease, and getting rich quickly. Whether such ideas are labelled "occult" is somewhat arbitrary, but they have similar superstitious qualities.

We have so far neglected to consider

a category of occult beliefs that do make demands on believers' lives and extract heavy costs of belief. Occultisms such as Scientology, Theosophy, Satanism, and UFO cults resemble religions rather than ordinary superstitions, and there is evidence that they serve needs usually associated with religions, such as affiliation, moral direction, and an occasion for profound emotion (Bainbridge and Stark 1980). Such belief systems often demand total commitment, monetary and otherwise, from their members.

An explanation for the recent proliferation of such cults is then best couched in terms of developments in American religious practices. Stark and Bainbridge, at the University of Washington, have provided such an explanation, along with compelling documentation. A marked decline in membership in traditional religions over the past two decades has coincided with their theological retreat toward a more abstract, less personal deity, and with an orientation of these religions toward civil rights and other secular concerns, with consequently less investment in individual parishioners' needs (Bainbridge and Stark 1980; Stark and Bainbridge, in press; Glock and Bellah 1976). However, private belief in and need for the supernatural has not declined, and thus we infer that there has been a large population pool available for conversion to new, unorthodox religions, including those of the occult variety. In support of this interpretation, Bainbridge and Stark (1980) have found a negative correlation between membership in organized occult groups or reports of mystic psychic experiences, and membership in traditional religions.

In general, we do not adopt superstitions or fall prey to cognitive biases in areas where empirical approaches bear fruit and where illusory beliefs would be costly. As Sagan (1979, p. 93) observes, "A people going to war may sing over their spears in order to make them more effective. If there ever have been people who felt they could defeat an enemy in war merely by singing and who therefore dispensed with spears, we have not heard of them; they were, undoubtedly, all dispatched."

In areas where judgments under uncertainty are important, we self-consciously avoid biases and fallacies.

Thus, we have institutionalized elements of the scientific method, including meticulous weighing of alternative hypotheses, into police work, criminal law, and medical diagnosis. Under conditions of uncertainty, and where the cost of illusory belief is low, however, superstitions will surface and will be maintained through the aid of our somewhat faulty cognitive apparatus. In the last two decades it has become socially permissible to entertain occult beliefs as well as many other deviant beliefs and values, and conventional meaning systems and social orders have changed rapidly, perhaps generating widespread feelings of uncertainty and occult beliefs in the process. In addition, occultisms in the form of religious cults have moved into the void created by the recent decline of traditional religions.

Deficiencies in science education

There remains the question of how people maintain occult beliefs in the face of contravening scientific opinion. Granted that the popular media present a distorted picture, and that dependence upon our intuitive cognitions can also result in occultisms. The public nevertheless does seem to recognize that science emphatically rejects most occultisms. The layperson usually accepts scientific opinion unquestioningly, even when it is strikingly counter to his own intuitive understandings, as in the case of the atomic structure of matter or the astronomy of the solar system. Why are occult beliefs an exception to this customary deference to scientific authority?

One general explanation rests on the observation that people seem adept at compartmentalizing incongruent beliefs. We can comfortably live with disparate scientific, religious, and common-sense approaches to different beliefs, and employ the belief approach most suitable to the personal need at hand. Personal needs which support occult beliefs may include, for instance, a need to assert the validity of one's own common-sense judgment vis-à-vis scientific "authority," needs for feelings of control and predictability, and a need for affiliation with a religious community. If the need to maintain an irrational belief outweighs any cost associated with maintaining it, the

fact that the belief is not rational or scientifically supportable does not usually enter the equation. If cognitive dissonance does occur in maintaining an occult belief in spite of scientific debunking, any number of simple rationalizations, such as "Scientists are prejudiced about paranormal phenomena," will serve to reduce the cognitive tension. It is thus not really inexplicable that widespread occult beliefs exist within our most scientifically advanced societies.

Nevertheless it is our impression that the occult trend cannot be attributed wholly to innate cognitive flaws and emotional needs, but that current practices in the field of science education itself facilitate the rationalizing and compartmentalizing of occult beliefs. We have examined three major aspects of this problem.

First, from elementary school through graduate training, science seldom seems to be taught as a cognitive tool, a way of reaching deeper understanding of our environment. It is taught instead as a set of facts and concepts to be acquired by the same rote methods used in other academic subjects (Godfrey 1979). Even at graduate schools, research methodology appears to be taught as a set of advanced laboratory techniques, specific to the subject matter at hand. From elementary school onward the student does not seem to learn about the validity of scientific approaches vis-à-vis his intuitive understandings, but is simply heavily socialized to accept certain counterintuitive facts—the earth is round and rotates, matter is structured atomically—as items of culturally given common sense. Science is taught in the context of a specific, often technical subject matter, such as chemistry or botany; religious claims, occult claims, everyday problems are seldom examined in the science classroom. The student is thus encouraged to compartmentalize science as a set of facts or at best a dry, technical methodology within a limited number of narrow domains, and to trust his intuitions in the larger spheres remaining. The occult is then naturally viewed as outside the domain of science, to be apprehended intuitively instead.

Second, many occult claims could be countered with even an elementary knowledge of scientific facts, but even

elementary knowledge may be largely lacking. Morison (1969) has questioned whether science has in fact had any effect in raising the cognitive sophistication of the lay public above prehistoric levels, and suggested as one test asking people whether all objects fall at the same rate. We have tested hundreds of college sophomores over the past several years (Singer, in press) with the problem of estimating the duration of flight of a 4-lb and a 2-lb lead weight dropped simultaneously from the same 16-ft height. Over half the students gave different estimates for the flight durations of the two weights. Fifteen percent gave estimates in the range of 4–50 seconds, perhaps envisioning them floating down like paper airplanes. On the same test we found that over half the students did not know that water in a tipped glass remains level, and many believed that islands float in the ocean and that the moon remains fixed in the sky over them, but is only visible at night. This is not a useful armamentarium for evaluating occult claims.

Third, many students have the impression that science is entirely subjective and unable to assess or predict the validity of ideas, apparently on the basis of limited exposure to philosophers such as Polanyi, Hansen, and Kuhn. In presenting perspectives on science in our classrooms, we have perhaps overdone the critical view of the validity of our knowledge. In a series of paradoxical confusions, students attribute more empirical validity to philosophy than to science itself, and the fact that science "changes its mind" is regarded as a totally discrediting weakness. We do not read these philosophers as subscribing to the total subjectivity of science, and we do not believe they would subscribe to such a position. It would seem a service to speak more plainly and more assertively about science's track record.

One benefit of studying the mechanisms of occult beliefs is that we can thereby highlight the characteristics of science, considered as a belief process. That is, we can look at science as a cognitive system deliberately constructed to avoid or compensate for the mechanisms involved in occult beliefs. For instance, we can say that science in theory trusts data and distrusts intuition, generates alternative hypotheses, systematically

attempts disconfirmation of favored hypotheses, uses mathematically calculated probabilities, and conscientiously engages in self-examination to determine whether values and motives are influencing beliefs. The question then arises whether the compensatory mechanisms of science are as comprehensive and effective as is feasible. Although the scientific enterprise is obviously successful, we have evidence that its compensatory mechanisms are not complete.

Einhorn and Hogarth (1978), Mahoney (1976), and Kahneman and Tversky (1973) have all found confirmatory cognitive biases, at a level approaching that of a layperson's, in scientists and mathematicians who were administered simple conceptual problems. Recent work in the psychology of science, particularly that of Mahoney (1976) and Mitroff (1974), has demonstrated the operation of confirmatory bias in actual scientific processes. In our own discipline, psychology, we have seen numerous cases of scientists operating in ways which seem intuitively correct to them on the basis of their personal experience, though objectively contraindicated. For example, scientifically trained clinicians continue to rely on personal interviews and clinical judgment in prediction and diagnosis of mental illness, despite twenty years of consistent evidence that simple actuarial techniques are more predictive (Dawes 1979).

Some scientists develop occult beliefs. Surveys have indicated, for example, that over half the natural and social scientists in the United States believe ESP to be established or likely (*Psychology Today* 1978; Wagner and Monnet 1979) and are either unaware of the small fraction of research psychologists who hold such a view, or convinced that their own intuitive understandings are somehow more correct than the scientific ones in this case. In addition, now as throughout the history of science there is a sprinkling of scientists, including eminent ones, who have been duped by the fraudulent practices of "psychics."

The evidence just presented raises the question of the locus of the norms of science and the mechanisms by which they are maintained. It is quite possible, for instance, that scientific rules

of belief formation operate primarily at a system level. Such rules may affect scientists' cognitive behavior or public statements under particular contingencies as enforced by the scientific community, but this public attitude may not be completely internalized by the scientist as an individual. There may be tensions between the beliefs uttered by the scientist as a professional person operating within a professional community and those entertained by him as a private person who is still humanly prone to the flaws of intuition. Such tensions may substantively affect the conduct of science or the formation of scientific belief.

How should the scientific community respond to the upsurge of popular interest in the occult? The interest in occultism and pseudoscience may in fact be dangerously distracting from rational solutions to social problems and corrosive to rationality, as some scientists have feared. It seems to us, however, that occult beliefs are more symptomatic of dislocating social trends than causal of them, and that they are usually compartmentalized well enough that they do not in themselves corrupt a practical rationality, any more than does a monotheistic faith or a belief that Moses parted the Red Sea. The most serious side effect of occult beliefs may be that they are inherently discrediting of science, although the evidence does not indicate that this outcome has been realized. While recent public disaffection with science and technology is often mentioned as a stimulus to occult belief, hard evidence for such disenchantment is lacking (Marshall 1979). Further, correlational studies have more often than not found no relation between negative feelings toward science and occult beliefs (Wuthnow 1978).

The most convincing rationale for a scientific response to the occult preoccupation may simply be scientific self-integrity. The following steps seem appropriate: issuing rebuttals to fraudulent or unsubstantiated occult claims—far from being beneath our dignity, this can be considered a compelling social responsibility; increasing the availability to the media of scientific expertise on the occult; helping the public recognize which media sources speak with scientific authority and which do not; treating occult concepts in science education,

including, perhaps, introductory textbooks; examining policies relating to occult courses and concepts that appear in the name of a university, and relating to the selection of books and films for public school reading and science classes; and reorienting science education so that science becomes more personal, more life-oriented, and more easily apprehended as a highly useful mode of inquiry.

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